(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization International Bureau



| (ULID BENEDEK IN BENEDEK KIN FENER KEN FENER EN BENEDEK KIN BENEDEK KIN BENEDEK KIN BENEDEK KON BENEDEK KEN

(43) International Publication Date 30 October 2003 (30.10.2003)

PCT

(10) International Publication Number WO 03/090343 A2

(51) International Patent Classification7:

(21) International Application Number: PCT/IB03/01253

(22) International Filing Date: 1 April 2003 (01.04.2003)

(25) Filing Language:

English

H₀3F

(26) Publication Language:

English

(30) Priority Data: 02076543.4

19 April 2002 (19.04.2002) EP

- (71) Applicant (for all designated States except US): KONIN-KLIJKE PHILIPS ELECTRONICS N.V. [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): PUTZEYS, Bruno, J., G. [BE/NL]; Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).
- (74) Agent: GROENENDAAL, Antonius, W., M.; Internationaal Octrooibureau B.V., Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

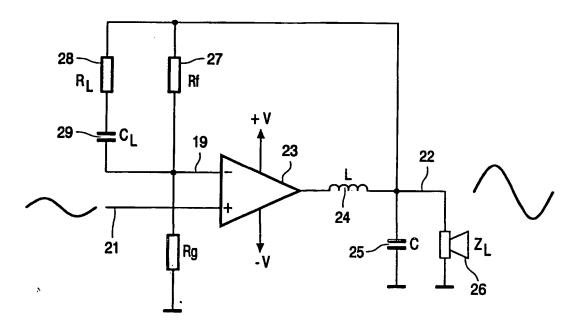
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

 without international search report and to be republished upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: POWER AMPLIFIER



(57) Abstract: A switching power amplifier of class D has switching means for generating a block wave signal by alternately switching the block wave signal between supply voltages. A filter (24,25) generates a power output signal (22) corresponding to an input signal to be amplified, which is coupled to a linear input (19) that is free of hysteresis. A control circuit (27,28,29) provides feedback between the output power signal and the linear input for controlling boththe gain in the operational frequency range and also said alternately switching of the switching means. Hence the amplifier oscillates controlled via the same feedback loop that also controls the operational behavior of the amplifier, resulting in low output impedance and low distortion.

WO 03/090343 A2

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization

International Bureau



1 (BARIA BUNDUN) IN BUNDO HARIA BUNDO BUNDO INI NI ABUNDO CON BARIAD NINI BUNDO BUNDO BUNDO BUNDO BUNDO BUNDO B

(43) International Publication Date 30 October 2003 (30.10.2003)

PCT

(10) International Publication Number WO 2003/090343 A3

(51) International Patent Classification⁷: 1/32, 3/45

H03F 3/217,

(21) International Application Number:

PCT/IB2003/001253

(22) International Filing Date:

1 April 2003 (01.04.2003)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

02076543.4

19 April 2002 (19.04.2002) EP

- (71) Applicant (for all designated States except US): KONIN-KLIJKE PHILIPS ELECTRONICS N.V. [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only) PUTZEYS, Bruno, J., G. [BE/NL]; Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).
- (74) Agent: GROENENDAAL, Antonius, W., M.; Philips Intellectual Property & Standards, Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

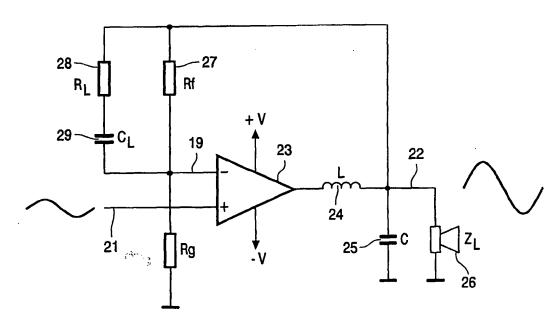
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

[Continued on next page]

(54) Title: POWER AMPLIFIER



(57) Abstract: A switching power amplifier of class D has switching means for generating a block wave signal by alternately switching the block wave signal between supply voltages. A filter (24,25) generates a power output signal (22) corresponding to an input signal to be amplified, which is coupled to a linear input (19) that is free of hysteresis. A control circuit (27,28,29) provides feedback between the output power signal and the linear input for controlling boththe gain in the operational frequency range and also said alternately switching of the switching means. Hence the amplifier oscillates controlled via the same feedback loop that also controls the operational behavior of the amplifier, resulting in low output impedance and low distortion.





(88) Date of publication of the international search report: 3 June 2004

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H03F3/217 H03F1/32 H03F3/45

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols) $IPC \ 7 \ H03F$

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Х	EP 1 049 247 A (ST MICROELECTRONICS SRL) 2 November 2000 (2000-11-02)	1-5,7,9, 10
Y	page 2, line 31 - page 3, line 53; figure	6,8
Y	US 5 722 052 A (ABDI BEHROOZ L ET AL) 24 February 1998 (1998-02-24) column 4, line 40 - column 8, line 17; figure 6	6
Y	FR 1 602 588 A (SESCO) 28 December 1970 (1970-12-28) page 6, line 6 - page 7, line 40; figure 4	8
X	US 4 415 863 A (TOKUMO AKIO) 15 November 1983 (1983-11-15)	1-5,7,9, 10
A	column 3, line 13 - column 4, line 8; figure 3	6,8

Further documents are listed in the continuation of box C.	Patent family members are listed in annex.		
Special categories of cited documents: A* document defining the general state of the art which is not considered to be of particular relevance. E* earlier document but published on or after the international filling date C* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) O* document referring to an oral disclosure, use, exhibition or other means P* document published prior to the international filing date but later than the priority date claimed	 *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. *&* document member of the same patent family 		
Date of the actual completion of the international search	Date of mailing of the international search report		
24 March 2004	31/03/2004		
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2	Authorized officer		
NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Fedi, G		



C.(Continu	ation) DOCUMENTS CONSIDERED TO BE RELEVANT			
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
X A	EP 0 655 830 A (KAISER AEROSPACE & ELECTRONICS) 31 May 1995 (1995-05-31) page 4, line 41 - page 6, line 7; figure 6	1,2,5,7, 9,10 6,8		
· (US 2002/008574 A1 (KIMBALL DON ET AL)	10		
1	24 January 2002 (2002-01-24) page 3, right-hand column, line 9 - page 5, right-hand column, line 15	1-9		
	·			

In ation patent family members

	Internation No.
ļ	PCT/10 J3/01253

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
EP 1049247	A	02-11-2000	EP US	1049247 A1 6346852 B1	02-11-2000 12-02-2002
US 5722052	Α	24-02-1998	DE GB	19707990 A1 2310771 A ,B	13-11-1997 03-09-1997
FR 1602588	Α	28-12-1970	NONE		
US 4415863	Α	15-11-1983	NONE		
EP 0655830	Α	31-05-1995	US EP JP	5479337 A 0655830 A1 7263973 A	26-12-1995 31-05-1995 13-10-1995
US 2002008574	A1	24-01-2002	US AU CN WO JP	6300826 B1 5838501 A 1443395 T 0186806 A2 2003533116 T	09-10-2001 20-11-2001 17-09-2003 15-11-2001 05-11-2003

This Page is Inserted by IFW Indexing and Scanning Operations and is not part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

☐ BLACK BORDERS
IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
☐ FADED TEXT OR DRAWING
☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
☐ SKEWED/SLANTED IMAGES
☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
☐ GRAY SCALE DOCUMENTS
☐ LINES OR MARKS ON ORIGINAL DOCUMENT
☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
П отнер.

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.